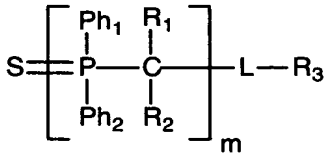
We Claim:

1. A method of preparing a photothermographic emulsion comprising:

(A) providing a photothermographic dispersion of a preformed photosensitive silver halide and a non-photosensitive source of reducible silver ions, and performing the following steps in order,

(B) providing one or more diphenylphosphine sulfide compounds, in association with said preformed silver halide grains and the non-photosensitive source of reducible silver ions, said diphenylphosphine sulfide compound being represented by the following Structure PS:



(PS)

wherein Ph_1 and Ph_2 are the same or different phenyl groups, R_1 and R_2 are each independently hydrogen or an alkyl or phenyl group, L is a direct bond or a divalent linking group, m is 1 or 2 and when m is 1, R_3 is a monovalent group and when m is 2, R_3 is a divalent aliphatic linking group having 1 to 20 carbon, nitrogen, oxygen, or sulfur atoms in the chain,

(C) chemically sensitizing said preformed silver halide grains by decomposing the diphenylphosphine sulfide compound represented above by Structure (PS) on or around said silver halide grains in an oxidizing environment to provide a photothermographic emulsion comprising chemically sensitized photosensitive silver halide grains in reactive association with said non-photosensitive source of reducible silver ions, and

(D) converting some of said reducible silver ions in said non-photosensitive source of reducible silver ions into photosensitive silver halide grains.

2. The method of claim 1 further comprising mixing said photothermographic emulsion with a binder and coating the resulting emulsion formulation onto a support.

3. The method of claim 1 wherein said non-photosensitive source of reducible silver ions is a silver fatty acid carboxylate having 10 to 30 carbon atoms in the fatty acid or a mixture of said silver fatty acid carboxylates, as least one of which carboxylates is silver behenate.

4. The method of claim 1 wherein Ph_1 and Ph_2 are the same or different phenyl groups, R_1 and R_2 are each independently hydrogen, L is a carbonyl [-(C=O)-] group, m is 1, and R_3 is a monovalent aliphatic group having 1 to 7 carbon atoms.

5. The method of claim 1 wherein said diphenylphosphine sulfide compound is provided in an amount of from about 1.5×10^{-6} to about 4×10^{-3} mol/mol of total silver from said non-photosensitive source of reducible silver ions in said photothermographic dispersion.

6. The method of claim 1 wherein said reducible silver ions are converted to photosensitive silver halide by addition of a halogen-containing compound in an amount of from about from about 10^{-4} to about 10^{-1} mol of halogen atom per mol of non-photosensitive source of reducible silver ions.

7. The method of claim 1 wherein between 0.5 to about 5 mol % of said non-photosensitive source of reducible silver ions are converted to photosensitive silver halide.

8. The method of claim 1 wherein said diphenylphosphine sulfide compound is decomposed by the presence of an oxidizing agent that produces HSBr.

9. The method of claim 8 wherein said diphenylphosphine sulfide compound is decomposed by the presence of a hydrobromic acid salt of an N-heterocyclic compound that is associated with a pair of bromine atoms.

10. The method of claim 1 wherein said diphenylphosphine sulfide compound is decomposed by the multiple additions of one or more oxidizing agents.

11. The method of claim 1 wherein said chemical sensitizing step is carried out at a temperature of from about 10°C to about 30°C for up to 60 minutes.

12. The method of claim 1 further comprising, after said chemical sensitizing step, adding a spectral sensitizing dye to spectrally sensitize said photosensitive silver halide grains to from about 600 to about 1100 nm.

13. The method of claim 1 further comprising adding a reducing agent composition to said photothermographic emulsion formulation.

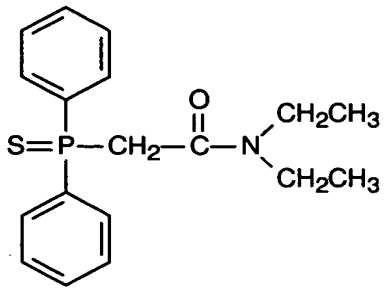
14. The method of claim 1 further comprising adding a phosphor to said photothermographic emulsion formulation.

15. A method of preparing a black-and-white photothermographic emulsion comprising:

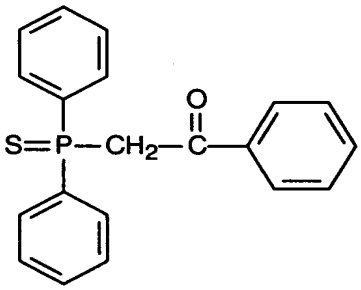
(A) providing a photothermographic dispersion of a preformed photosensitive silver halide and a non-photosensitive source of reducible silver ions, and performing the following steps in order:

(B) providing one or more diphenylphosphine sulfide compounds in association with said preformed silver halide grains and said non-photosensitive

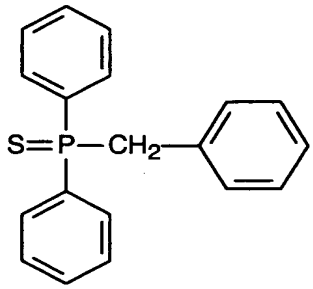
source of reducible silver ions, said one or more diphenylphosphine sulfide compounds selected from at least one of the following compounds PS-1 to PS-19:



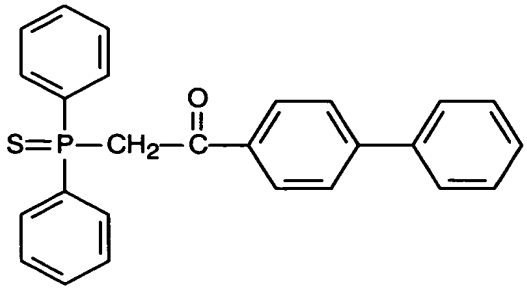
(PS-1)



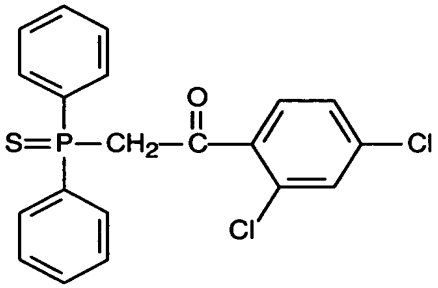
(PS-2)



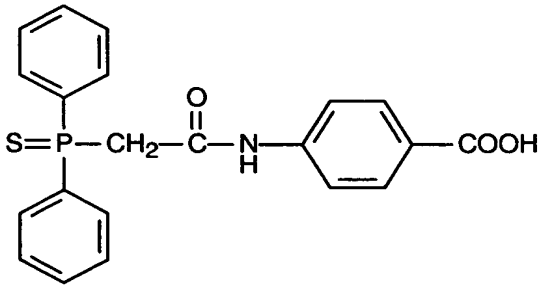
(PS-3)



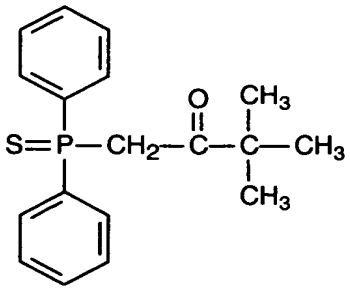
(PS-4)



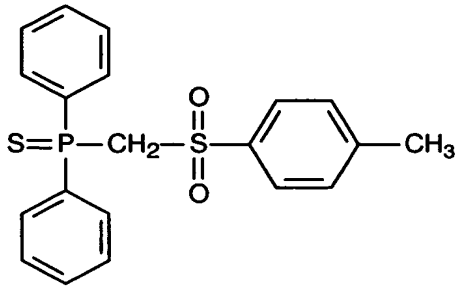
(PS-5)



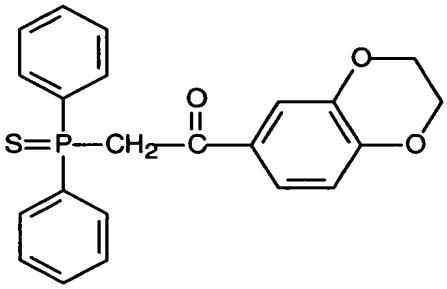
(PS-6)



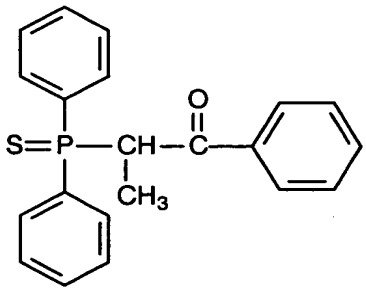
(PS-7)



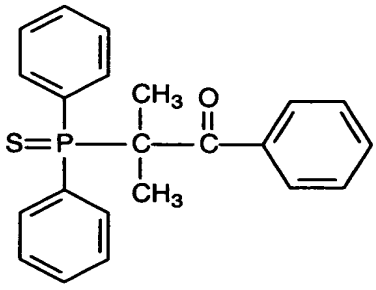
(PS-8)



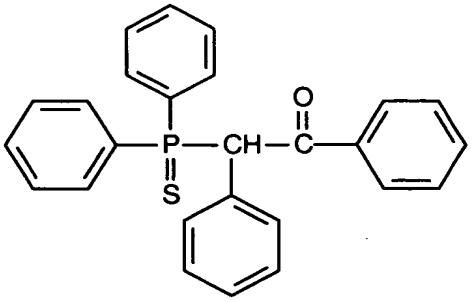
(PS-9)



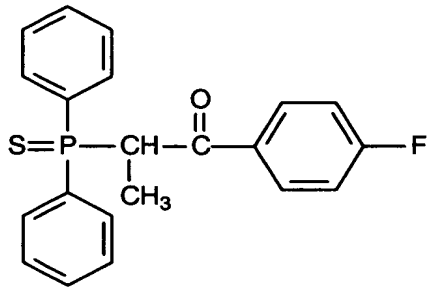
(PS-10)



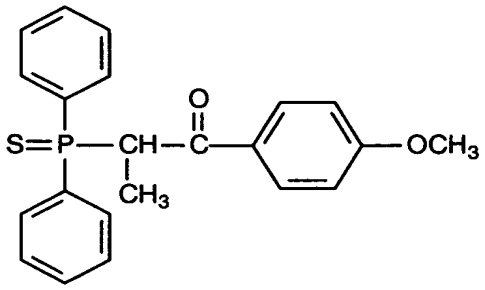
(PS-11)



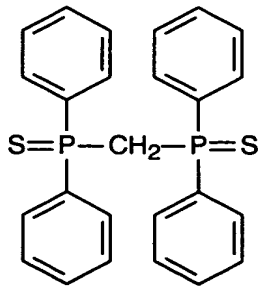
(PS-12)



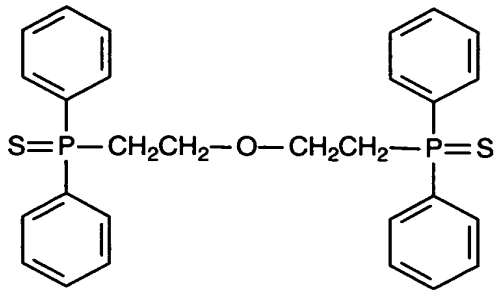
(PS-13)



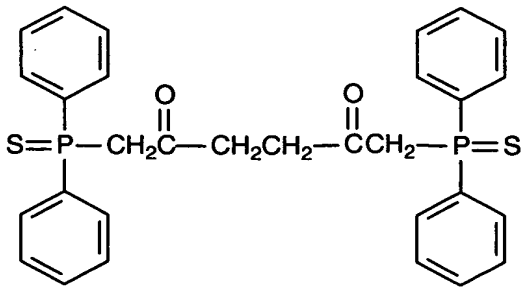
(PS-14)



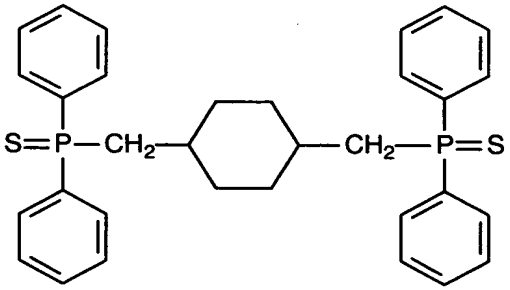
(PS-15)



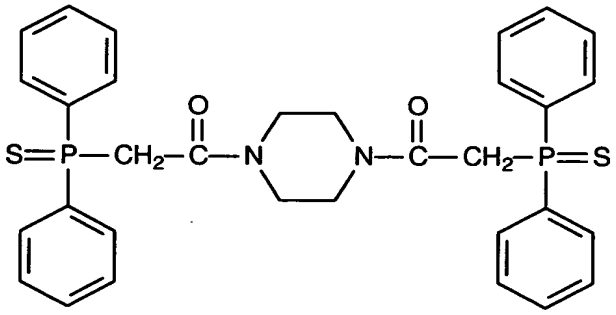
(PS-16)



(PS-17)



(PS-18)



(PS-19),

(C) chemically sensitizing said preformed silver halide grains by decomposing said one or more diphenylphosphine sulfide compounds on or around said silver halide grains by the addition, in one or more stages, of pyridinium hydrobromide perbromide to the silver halide grains at from about 20°C to about 30°C for up to 60 minutes, to provide a photothermographic emulsion comprising chemically sensitized photosensitive silver bromide grains in reactive association with said non-photosensitive source of reducible silver ions comprising silver behenate,

(D) converting from about 0.1 to about 10 mol % of the reducible silver ions in said non-photosensitive source of reducible silver ions into photosensitive silver bromide grains by addition of a bromide salt.

16. The method of claim 15 further comprising the addition to said photothermographic emulsion of a spectral sensitizing dye to spectrally sensitize said photosensitive silver bromide grains to from about 600 nm to about 1100 nm.

17. The method of claim 15 further comprising the addition of one or more antifoggants, antistatic agents, toners, matting agents, development accelerators, acutance dyes, post-processing stabilizers or stabilizer precursors, thermal solvents, shelf-life enhancing agents, co-developers, contrast enhancing agents, or high-contrast agents to said photothermographic emulsion.

18. The method of claim 15 further comprising adding a phosphor to said photothermographic emulsion.

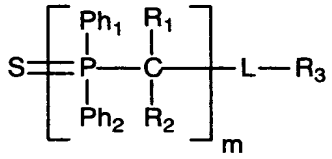
19. The method of claim 15 further comprising the addition of a hydrophobic binder to said photothermographic emulsion to provide a photo-thermographic emulsion formulation.

20. The method of claim 19 further comprising coating said photothermographic emulsion formulation on a support.

21. A method of preparing a photothermographic material comprising:

(A) providing a photothermographic dispersion of a preformed photosensitive silver halide and a non-photosensitive source of reducible silver ions, and performing the following steps in order,

(B) providing one or more diphenylphosphine sulfide compounds in association with said preformed silver halide grains and said non-photosensitive source of reducible silver ions, said diphenylphosphine sulfide compound being represented by the following Structure PS:



(PS)

wherein Ph_1 and Ph_2 are the same or different phenyl groups, R_1 and R_2 are each independently hydrogen or an alkyl or phenyl group, L is a direct bond or a divalent linking group, m is 1 or 2 and when m is 1, R_3 is a monovalent group and when m is 2, R_3 is a divalent aliphatic linking group having 1 to 20 carbon, nitrogen, oxygen, or sulfur atoms in the chain,

(C) chemically sensitizing said preformed silver halide grains by decomposing said one or more diphenylphosphine sulfide compounds on or around said silver halide grains in an oxidizing environment to provide a photothermographic emulsion comprising chemically sensitized photosensitive silver halide grains in reactive association with said non-photosensitive source of reducible silver ions,

(D) converting some of the reducible silver ions in said non-photosensitive source of reducible silver ions into photosensitive silver halide grains.

(E) simultaneously with any of steps (A) through (D), or subsequently to step (D), adding a binder to form a photothermographic emulsion formulation, and

(F) after step (E), coating and drying said emulsion formulation on a support to provide a photothermographic material.

22. The method of claim 21 wherein, simultaneously or subsequently to step (E), a protective overcoat formulation is coated over said photothermographic emulsion formulation.

23. The method of claim 22 wherein, prior to or simultaneously with step (F), a carrier layer is coated on said support underneath said photothermographic emulsion formulation.